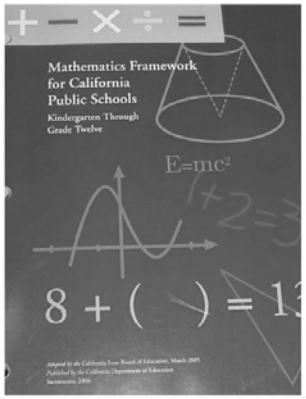
Problem Solving

A Bridge to Common Core Practices

Welcome and Agenda

- Problem Solving and Math Reasoning
- Intro to Common Core Standards for Mathematical Practice
- Four-Step PS Process Defined
  - Understand, Plan, Solve, Check
- Problem Solving Models
- Applications
- Closure

Problem Solving and Mathematical Reasoning



Common Core Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Similar but More Depth

- Comparison of MR Standards and Common Core Standards for Mathematical Practices
  - Connections and Similarities
  - Depth

Common Core Standards: Understanding the Mathematical *Practices* Standards

These Standards are not intended to be new names for old ways of doing business. They are a call to take the next step. It is time for states to work together to build on lessons learned from two decades of standards based reforms. It is time to recognize that standards are not just promises to our children, but promises we intend to keep.

— CCSS (2010, p.5)

Problem Solving

- Teaching students a **thinking process** for a problem the student does not know how to approach or solve.
  - Understand
  - Plan
  - Solve
  - Check
- The best way to improve problem solving skills is to **practice** problem solving with explicit instruction.
  - Verbal
  - Concrete
  - Pictorial
  - Symbolic

Understand

- Identify what is known by reading the problem carefully, sentence by sentence.
- Watch For the Operation
- Identify the question to answer or the task to perform.
  - What 7 coins make $0.49?
  - List the seven coins that make $0.49.

CC Math Practices

- Make sense of problems and persevere in solving them
- Look for and make use of structure
- Reason abstractly and quantitatively

Plan

- Identify the strategy to use that makes the most sense.
- Decide how the strategy will be used.
  - Visuals – What will you draw?
  - Act It Out – What materials will you use?
  - Make A Table – How will it be formatted?
  - And so on…….

CC Math Practices

- Make sense of problems
- Reason abstractly and quantitatively
- Use appropriate tools strategically
- Look for and make use of structure

Solve

- Show all your work (thinking) from the strategy.
- Constantly check your work against what is known
- Make sure the question is answered or the task is done.

CC Math Practices

- Use appropriate tools strategically
- Attend to precision
- Look for and express regularity in repeated reasoning

Check

- Compare the work to what is known.
- Make sure the question is answered or the task completed.
- Check that the answer makes sense.

CC Math Practices

- Construct viable arguments and critique the reasoning of others
- Model with mathematics

Primary PS Model

- Primary Problem:

  I have 4 beads. I need 12 beads to make my bracelet. How many more beads do I need?

- Understand
- Plan
- Solve
- Check

Upper Grade Model

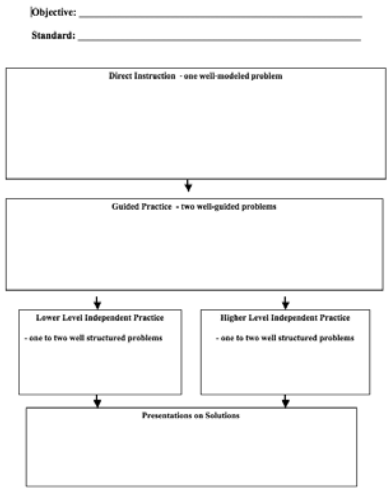
- Davis has some marbles in his collection. His friend gave him 38 marbles. Davis now has 63 marbles altogether. What equation can be used to find the original amount of marbles *m* in Davis' collection?

  - Understand
  - Plan
  - Solve
  - Check

Practice the Process

Understand **•Identify what is known by reading the problem carefully, sentence by sentence.** **•Watch for the operation** **•Identify the question to answer or the task to perform.**	**Teacher Actions**	**Student Actions**
Plan •Identify the strategy to use that makes the most sense. •Decide how the strategy will be used.		
Solve •Show all your work from the strategy. •Constantly check your work against what is known. •Make sure the question is answered or the task is done.		
Check •Compare the work to what is known. •Make sure the question is answered or the task completed. •Check that the answer makes sense.		

Putting All the Pieces Together



Closure